WHAT IS CLAIMED IS:

1. (amended) A method for synchronizing a mobile terminal to a wireless network, comprising the steps of:

a. receiving a signal comprising a synchronization code broadcast by a base-station with a mobile terminal, wherein said mobile terminal receiving said signal comprises at least two diversity branches and at least two filters;

b. processing said received signal by using at least two said diversity branches to determine at least one diversity output value prior to achieving code synchronization;

c. processing at least one said diversity output value to determine said synchronization code;

d. processing said received signal using at least two said diversity branches to synchronize a local oscillator of said mobile terminal based on said synchronization code.

2. (original) The method of claim 1 wherein processing said received signal using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the absolute value of said filter output in each said diversity branch; and

b. selecting which said output value has the largest absolute value, thereby determining said diversity output value;

3. (original) The method of claim 1 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the absolute value of said filter output in each said diversity branch; and

b. combining said output values thereby producing said diversity output value;

4. (original) The method of claim 1 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the absolute value of said filter output in each said diversity branch;

b. determining an estimate of the relative power of each said diversity branch relative to the power of the remaining diversity branches;

c. weighting said absolute value of said filter output for each said diversity branch by said relative power of said diversity branch thereby forming a weighted filter output for each said diversity branch; and

d. combining said weighted filter output values thereby producing a diversity output value.

5. (original) The method of claim 1 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the relative instantaneous parallel channel estimate of each said diversity branch relative to the other diversity branches;

b. determining the complex conjugate of each said relative instantaneous parallel channel estimate;

c. weighting each said filter output of each said diversity channel by the complex conjugate of said relative instantaneous parallel channel estimate of said diversity branch thereby producing a co-phased and weighted filter output for each said diversity branch;

d. combining each said co-phased and weighted filter output thereby producing a co-phased, weighted output magnitude; and

e. determining the real part of said co-phased, weighted output magnitude, thereby producing a diversity output value.

6. (original) The method of claim 1 wherein step (d) further comprising the steps of:

a. generating a plurality of partial code correlations $y_{m,k}$, each said partial code correlation being characterized by a time index 'k', and a diversity branch index 'm';

b. for each diversity branch, Fourier transforming said plurality of partial code correlations $y_{m,k}$ thereby forming a plurality of Fourier transform vectors;

c. determining the absolute value of each element of each said Fourier transform vector;

d. selecting for each said Fourier transform vector element, the corresponding Fourier transform vector element with largest absolute value from said plurality of Fourier transform vectors, thereby forming a selection diversity Fourier transform vector X(p);

e. averaging said selection diversity Fourier transform vector over at least one Fourier transform block thereby forming an averaged selection diversity Fourier transform vector; and

f. selecting the element of said averaged selection diversity Fourier transform vector with largest absolute value.

7. (original) The method of claim 1 wherein step (d) further comprising the steps of:

a. generating a plurality of partial code correlations $y_{m,k}$, each said partial code correlation being characterized by a time index 'k', and a diversity branch index 'm';

b. for each diversity branch, Fourier transforming said plurality of partial code correlations $y_{m,k}$ thereby forming a plurality of Fourier transform vectors

c. determining the absolute value of each element of each said Fourier transform vector;

d. summing the absolute value of each said corresponding Fourier transform vector element from each said Fourier transform vector, thereby forming a non-coherent combining diversity Fourier transform vector;

e. averaging said non-coherent combining diversity Fourier transform vector over at least one Fourier transform block thereby forming an averaged non-coherent combining diversity Fourier transform vector; and

f. selecting the element of said averaged non-coherent combining diversity Fourier transform vector with largest absolute value.

8. (original) The method of claim 1 wherein step (d) further comprising the steps of:

a. determining relative power of each said diversity branch relative to other said diversity branches;

b. generating a plurality of partial code correlations $y_{m,k}$, each said partial code correlation being characterized by a time index 'k', and a diversity branch index 'm',

c. for each diversity branch, Fourier transforming said plurality of partial code correlations $y_{m,k}$ thereby forming a plurality of Fourier transform vectors;

d. determining the absolute value of each element of each said Fourier transform vector;

e. weighting the absolute value of each said element of each said Fourier transform vector by the relative power of said diversity branch associated with said Fourier transform vector thereby forming weighted Fourier transform vector elements;

f. summing each said corresponding weighted Fourier transform vector element from each said Fourier transform vector, thereby forming a weighted non-coherent combining diversity Fourier transform vector;

g. averaging said weighted non-coherent combining diversity Fourier transform vector over at least one Fourier transform block thereby forming an averaged weighted non-coherent combining diversity Fourier transform vector; and

h. selecting the element of said averaged weighted non-coherent combining diversity Fourier transform vector with the largest absolute value.

9. (original) The method of claim 1 wherein step (d) further comprising the steps of:

a. determining a plurality of partial code correlations $y_{m,k}$, each said partial code correlation $y_{m,k}$ being characterized by a time index 'k' and a diversity channel index 'm';

b. determining the complex conjugate $y^*_{m,k}$ of partial code correlation $y_{m,k}$

b. determining a differential detection output $X_m(k)$ according to $X_m(k) = y_{m,k}\ y^*_{m,k-1}$ for each said diversity branch;

c. determining the absolute value of each said differential detection output X(k);

d. selecting the said differential detection output with the largest absolute value thereby forming a selection diversity differential detection output;

e. determining a plurality of selection diversity detection outputs for a plurality of k index values;

f. averaging said plurality of selection diversity differential detection outputs thereby forming an average selection diversity detection output; and

g. determining the synchronization frequency from said averaged selection diversity differential detection output.

10. (original) The method of claim 1 wherein step (d) further comprising the steps of:

a. determining a plurality of partial code correlations $y_{m,k}$, each said partial code correlation $y_{m,k}$ being characterized by a time index k and a diversity channel index m;

b. determining the complex conjugate $y^*_{m,k}$ of partial code correlation $y_{m,k}$

c. determining a differential detection output $X_m(k)$ according to $X_m(k) = y_{m,k} y^*_{m,k-1}$ for each said diversity branch;

d. combining said differential detection output values thereby producing said coherent diversity differential detection output value

e. determining a plurality of coherent diversity detection outputs for a plurality of k index values;

f. averaging said plurality of coherent diversity differential detection outputs thereby forming an average coherent diversity detection output; and

g. determining the synchronization frequency from said averaged coherent diversity differential detection output.

11. (original) The method of claim 1 wherein step (d) further comprising the steps of:

a. determining a plurality of partial code correlations $y_{m,k}$, each said partial code correlation $y_{m,k}$ being characterized by a time index k and a diversity channel index m;

b. determining the complex conjugate $y^*_{m,k}$ of partial code correlation $y_{m,k}$

c. determining the relative power, p_m, of each said diversity branch

d. determining a differential detection output $X_m(k)$ according to $X_m(k) = y_{m,k} y^*_{m,k-1}$ for each said diversity branch;

e. weighting said differential detection output by the relative power for each said diversity branch

f. combining said weighted differential detection output values thereby producing said weighted coherent diversity differential detection output value

g. determining a plurality of weighted coherent diversity detection outputs for a plurality of k index values;

h. averaging said plurality of weighted coherent diversity differential detection outputs thereby forming an average weighted coherent diversity differential detection; and

i. determining the synchronization frequency from said averaged weighted coherent diversity differential detection.

12. (amended) A method for synchronizing a mobile terminal to a wireless network comprising the steps of:

a. receiving a signal comprising a synchronization code broadcast by a base-station with a mobile terminal, wherein said mobile terminal receiving said signal comprises at least two diversity branches and at least two filters;

b. processing said received signal using at least two said diversity branches to determine at least one diversity output value prior to achieving code synchronization;

c. comparing said diversity output value to a predetermined threshold;

d. determining said synchronization code; and

e. processing said received signal using at least two said diversity branches to synchronize the local oscillator of said mobile terminal based on said synchronization code.

13. (original) The method of claim 12 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the absolute value of said filter output in each said diversity branch; and

b. selecting which said output value has the largest absolute value, thereby determining said diversity output value;

14. (original) The method of claim 12 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the absolute value of said filter output in each said diversity branch; and

b. combining said output values thereby producing said diversity output value;

15. (original) The method of claim 12 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the absolute value of said filter output in each said diversity branch;

b. determining an estimate of the relative power of each said diversity branch relative to the power of the remaining diversity branches;

c. weighting said absolute value of said filter output for each said diversity branch by said relative power of said diversity branch thereby forming a weighted filter output for each said diversity branch; and

d. combining said weighted filter output values thereby producing a diversity output value.

16. (original) The method of claim 12 wherein processing said received signals using at least two said diversity branches to determine at least one diversity output value further comprises the steps of:

a. determining the relative instantaneous parallel channel estimate of each said diversity branch relative to the other diversity branches;

b. determining the complex conjugate of each said relative instantaneous parallel channel estimate;

c. weighting each said filter output of each said diversity channel by the complex conjugate of said relative instantaneous parallel channel estimate of said diversity branch thereby producing a co-phased and weighted filter output for each said diversity branch;

d. combining each said co-phased and weighted filter output thereby producing a co-phased, weighted output magnitude; and

e. determining the real part of said co-phased, weighted output magnitude, thereby producing a diversity output value.

17. (original) The method of claim 12 wherein step (e) further comprising the steps of:

a. generating a plurality of partial code correlations $y_{m,k}$, each said partial code correlation being characterized by a time index 'k', and a diversity branch index 'm';

b. for each diversity branch, Fourier transforming said plurality of partial code correlations $y_{m,k}$ thereby forming a plurality of Fourier transform vectors;

c. determining the absolute value of each element of each said Fourier transform vector;

d. selecting for each said Fourier transform vector element, the corresponding Fourier transform vector element with largest absolute value from said plurality of Fourier transform vectors, thereby forming a selection diversity Fourier transform vector X(p);

e. averaging said selection diversity Fourier transform vector over at least one Fourier transform block thereby forming an averaged selection diversity Fourier transform vector; and

f. selecting the element of said averaged selection diversity Fourier transform vector with largest absolute value.

18. (original) The method of claim 12 wherein step (e) further comprising the steps of:

a. generating a plurality of partial code correlations $y_{m,k}$, each said partial code correlation being characterized by a time index 'k', and a diversity branch index 'm';

b. for each diversity branch, Fourier transforming said plurality of partial code correlations $y_{m,k}$ thereby forming a plurality of Fourier transform vectors;

c. determining the absolute value of each element of each said Fourier transform vector;

d. summing the absolute value of each said corresponding Fourier transform vector element from each said Fourier transform vector, thereby forming a non-coherent combining diversity Fourier transform vector;

e. averaging said non-coherent combining diversity Fourier transform vector over at least one Fourier transform block thereby forming an averaged non-coherent combining diversity Fourier transform vector; and

f. selecting the element of said averaged non-coherent combining diversity Fourier transform vector with largest absolute value.

19. (original) The method of claim 12 wherein step (e) further comprising the steps of:

a. determining relative power of each said diversity branch relative to other said diversity branches;

b. generating a plurality of partial code correlations $y_{m,k}$, each said partial code correlation being characterized by a time index 'k' and a diversity branch index 'm';

c. for each diversity branch, Fourier transforming said plurality of partial code correlations $y_{m,k}$ thereby forming a plurality of Fourier transform vectors;

d. determining the absolute value of each element of each said Fourier transform vector;

e. weighting the absolute value of each said element of each said Fourier transform vector by the relative power of said diversity branch associated with said Fourier transform vector thereby forming weighted Fourier transform vector elements;

f. summing each said corresponding weighted Fourier transform vector element from each said Fourier transform vector, thereby forming a weighted non-coherent combining diversity Fourier transform vector;

g. averaging said weighted non-coherent combining diversity Fourier transform vector over at least one Fourier transform block thereby forming an averaged weighted non-coherent combining diversity Fourier transform vector; and

h. selecting the element of said averaged weighted non-coherent combining diversity Fourier transform vector with the largest absolute value.

20. (original) The method of claim 12 wherein step (e) further comprising the steps of:

a. determining a plurality of partial code correlations $y_{m,k}$, each said partial code correlation $y_{m,k}$ being characterized by a time index 'k' and a diversity channel index 'm';

b. determining the complex conjugate $y^*_{m,k}$ of partial code correlation $y_{m,k}$

b. determining a differential detection output $X_m(k)$ according to $X_m(k) = y_{m,k} y^*_{m,k-1}$ for each said diversity branch;

c. determining the absolute value of each said differential detection output X(k);

d. selecting the said differential detection output with the largest absolute value thereby forming a selection diversity differential detection output;

e. determining a plurality of selection diversity detection outputs for a plurality of k index values;

f. averaging said plurality of selection diversity differential detection outputs thereby forming an average selection diversity detection output; and

g. determining the synchronization frequency from said averaged selection diversity differential detection output.

21. (original) The method of claim 12 wherein step (e) further comprising the steps of:

a. determining a plurality of partial code correlations $y_{m,k}$, each said partial code correlation $y_{m,k}$ being characterized by a time index k and a diversity channel index m;

b. determining the complex conjugate $y^*_{m,k}$ of partial code correlation $y_{m,k}$

c. determining a differential detection output $X_m(k)$ according to $X_m(k) = y_{m,k}\, y^*_{m,k-1}$ for each said diversity branch;

d. combining said differential detection output values thereby producing said coherent diversity differential detection output value

e. determining a plurality of coherent diversity detection outputs for a plurality of k index values;

f. averaging said plurality of coherent diversity differential detection outputs thereby forming an average coherent diversity detection output; and

g. determining the synchronization frequency from said averaged coherent diversity differential detection output.

22. (original) The method of claim 12 wherein step (e) farther comprising the steps of:

a. determining a plurality of partial code correlations $y_{m,k}$, each said partial code correlation $y_{m,k}$ being characterized by a time index k and a diversity channel index m;

b. determining the complex conjugate $y^*_{m,k}$ of partial code correlation $y_{m,k}$

c. determining the relative power, p_m, of each said diversity branch

d. determining a differential detection output $X_m(k)$ according to $X_m(k) = y_{m,k} y^*_{m,k-1}$ for each said diversity branch;

e. weighting said differential detection output by the relative power for each said diversity branch

f. combining said weighted differential detection output values thereby producing said weighted coherent diversity differential detection output value

g. determining a plurality of weighted coherent diversity detection outputs for a plurality of k index values;

h. averaging said plurality of weighted coherent diversity differential detection outputs thereby forming an average weighted coherent diversity differential detection; and

i. determining the synchronization frequency from said averaged weighted coherent diversity differential detection.

23. (original) A method for synchronizing a mobile terminal to a wireless WCDMA network comprising the steps of:

a. receiving a signal comprising a primary synchronization code, a secondary synchronization code and a Gold code, broadcast by a base-station with a mobile terminal, wherein said mobile terminal comprises at least two diversity branches and at least two filters;

b. processing said received signal using at least two said diversity branches to determine the primary synchronization code;

c. determining the slot boundary based upon the determination of said primary synchronization code;

d. processing said received signal using at least two said diversity branches to determine the secondary synchronization code based upon said slot boundary;

e. determining the code group based upon the determination of said secondary synchronization code;

f. processing said received signal using at least two said diversity branches to determine the Gold code based upon said slot boundary and said code group; and

g. synchronizing the local oscillator of said mobile terminal based upon said Gold code.

24. (original) A method for synchronizing a mobile terminal to a wireless WCDMA network comprising the steps of:

a. receiving a signal comprising a primary synchronization code, a secondary synchronization code and a Gold code, broadcast by a base-station with a mobile terminal, wherein said mobile terminal comprises

1) at least one non-coherent combining diversity receiver with at least two diversity branches and wherein each diversity branch further comprises a 256 symbol primary synchronization code matched filter;

2) at least one coherent combining diversity receiver with at least two diversity branches and wherein each diversity branch further comprises a primary and secondary synchronization code matched correlator;

3) at least one non-coherent combining diversity receiver with at least two diversity branches and wherein each diversity branch further comprises a Gold code matched correlator; and

4) at least one Fourier transform non-coherent combining diversity frequency synchronization receiver with at least two diversity branches;

b. processing said received signal using said non-coherent combining diversity receiver to determine M consecutive non-coherent combining diversity output values;

c. averaging said M consecutive non-coherent combining diversity output values over N slot repetitions;

d. selecting the maximum value of step c to determine said primary synchronization code;

e. determining the slot boundary from said primary synchronization code;

f. correlating said received signal against each of the 64 secondary synchronization codes and the 15 circular rotations of each said secondary synchronization code using said coherent combining diversity receiver, wherein the channel estimate is provided by the primary synchronization code correlator output, thereby determining 960 coherent combining diversity output values;

g. determining the secondary synchronization code based upon the maximum value of said 960 coherent combining diversity output values;

i. correlating for R consecutive samples said received signal against each of the 8 possible Gold codes to determine 8 Gold code diversity outputs using said non-coherent combining diversity receiver;

j. generating a pluralities of said 8 Gold code diversity outputs;

j. determining said Gold code based upon said pluralities of Gold code non-coherent combining diversity output values; and

k. synchronizing the local oscillator of said mobile terminal with said Fourier transform non-coherent combining diversity frequency synchronization receiver based upon said Gold code.